

Citation:

Johnson L, Mander AP, Jones LR, Emmett PM, Jebb SA. A prospective analysis of dietary energy density at age 5 and 7 years and fatness at 9 years among UK children. *Int J Obes (Lond)*. 2008 Apr;32(4):586-93. Epub 2007 Oct 2.

PubMed ID: [17912267](#)

Study Design:

Longitudinal, Observational Cohort study

Class:

B - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To assess whether high dietary energy density (DED) is associated with increased fat mass and risk of excess adiposity in free-living children.

Inclusion Criteria:

Avon Longitudinal Study of Parents and Children (ALSPAC) subsample, Children in Focus, data were used.

- ALSPAC is a study of all pregnant women in Avon with expected delivery date April 1, 1991 to December 31, 1992 resulting in 14,541 pregnant women participants and 13,988 babies alive to at least year one.
- Children in Focus is random subsample of 1432 children from cohort of children born in the last 6 months of the study.
- Complete data on diet and body composition were available for 521 (36%) children at age 5 and 9 years, 682 (48%) at 7 and 9 years and 509 (36%) children had data on diet at 5 and 7 years as well as body composition at age 9 years.

Exclusion Criteria:

Described participants of the ALSPAC study who were not part of the Children in Focus subsample and/or did not have sufficient data available relevant to the study.

Description of Study Protocol:

Recruitment from the Avon Longitudinal Study of Parents and Children (ALSPAC) subsample, Children in Focus, which were children born in the last 6 months of the study period (June through December 1992).

Design Longitudinal, observational cohort study

Blinding used (if applicable) not specified

Intervention (if applicable) not applicable

Statistical Analysis (SPSS version 11.0)

- Mean, standard of error
- Intra class correlation coefficients
- Pearson's correlation coefficient
- Multiple logistic regression analysis
- Adjusted and unadjusted analyses related to confounders

Data Collection Summary:

Timing of Measurements

- Dietary data collected at age 5.2 ± 0.06 and 7.4 ± 0.12 years, using 3-day unweighed diet diaries.
- Fat mass (kg) measured at 9.8 ± 0.15 years.
- Amount of time watching TV asked via survey at 4 1/2 years old.
- Parental data collected via self report survey at 32 weeks gestation.

Dependent Variables

- Body fat mass estimated at 9 years using DEXA

Independent Variables

- Dietary Energy Density (DED) (kJg^{-1}) = total food energy(kJ)/ total food weight (g) excluding drinks
- Ratio of Energy Intake (EI) (kJg^{-1}) from all drinks defined as milk, fruit juice, fruit squash and cordials, fizzy drinks, water and flavoured water, hot chocolate, teas, coffee and alcohol to Estimated Energy Requirements (EER).

Control Variables

- Misreporting of energy intake
- Dietary fat
- Dietary fiber
- Overweight status at baseline
- TV watching
- Socioeconomic status
- Parental overweight status

Description of Actual Data Sample:

Initial N:

Children in Focus subsample = 1432

- 5 and 9 year data available, N = 521
- 7 and 9 year data available, N = 682
- 5 and 7 diet data + 9 year body composition data, N = 509

Attrition (final N): varying groups of available data included in analyses

Age: 5.2 ± 0.06 , 7.4 ± 0.12 and 9.8 ± 0.15 years

Ethnicity: not reported

Other relevant demographics:

Sex was relatively evenly distributed with 54-55% male in each subset studied.

Anthropometrics

Location: all subjects were born in Avon, United Kingdom

Summary of Results:

Key Findings:

- Mean Diet Energy Density at age 5 years was higher among children with excess adiposity at age 9 years compared to the remaining sample (8.8 ± 0.16 vs 8.5 ± 0.07 kJ/g), but there was no evidence of an association with excess adiposity at age 9 years (odds ratio = 1.14, 95% confidence interval: 0.90 - 1.44) after controlling

for potential confounders.

- Mean DED at age 7 years was higher among children with excess adiposity compared to the remaining sample (9.1 ± 0.12 vs 8.8 ± 0.06 kJ/g) and a 1 kJ/g rise in DED increased the odds of excess adiposity at 9 years by 36% (odds ratio = 1.36, 95% confidence interval: 1.09 - 1.69) after controlling for potential confounders.
- There was no correlation between Fat Mass Index (FMI) at age 9 years old and Diet Energy Density (DED) at either age 5 or 7 years ($r=0.01$ and 0.04).
- Tracking of DED between age 5 and 7 years was strong (ICC= 0.62, 95% CI 0.55-0.68)
- Children with excess adiposity had higher Fat Mass Index, Body Mass Index (BMI) and weight at age 5, 7 and 9 years.
- Only half of the children with excess adiposity at age 9 were classified as overweight by BMI at age 5 or 7.
- 30% of children with excess adiposity at age 9 years had two overweight parents compared to 12% of lean children.
- 10% of children with excess adiposity at age 9 had degree educated mothers compared to 20% of those with less educated mothers.
- Fat Mass Index increased with levels of TV watching.

Anthropometric and Maternal characteristics by adiposity status at age 9 years in children with complete dietary data at the baseline ages of 5 and 7 years (5 yr N=521, 7 yr N=682)

	5 yr (Normal Adiposity 9 yr)	5 yr (Excess Adiposity 9 yr)	7 yr (Normal Adiposity 9 yr)	7 yr (Excess Adiposity 9 yr)
N	424	97	545	137
BMI baseline	15.6 (15.0-16.3)	17.2 (16.3-18.2)	15.5 (14.7-16.3)	18.2 (16.8-19.9)
BMI 9 yr	16.4 (15.6-17.8)	21.4 (19.6-23.3)	16.5 (15.6-17.8)	21.1 (19.9-23.0)
BMI Maternal	22.1 (20.6-24.2)	23.8 (22.2-26.8)	22.0 (20.6-24.0)	23.6 (21.7-26.5)

Author Conclusion:

Higher DED at age 7 years, but not age 5 years, is a risk factor for excess adiposity at 9 years, perhaps reflecting deterioration in the ability to compensate for extra calories in an energy-dense diet. DED tracks strongly from age 5 to 7 years suggesting intervention to alter dietary habits need to commence at younger ages to prevent the formation of preferences for energy dense foods.

Reviewer Comments:

The authors acknowledge a limitation of the study is the lack of data on physical activity as well as the full dietary and body composition data being available for only 36% of the original Children in Focus sample.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

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|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | Yes |

4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes
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Validity Questions

1.	Was the research question clearly stated?	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	Was the selection of study subjects/patients free from bias?	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	Were study groups comparable?	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	Yes
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A

5.	Was blinding used to prevent introduction of bias?	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes

8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	Yes
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

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